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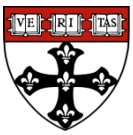

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1. Introduction

Urbanization is defined as "the demographic process whereby an increasing share of the national population lives within urban settlements."[1] Settlements are also defined as urban only if most of their residents derive the majority of their livelihoods from non-farm occupations. Throughout history, urbanization has been a key force in human and economic development.[2]

According to the UN population bureau (2010), Africa's population reached more than 1 billion in 2009, of whom around 40% lived in urban areas. It is expected to grow to 2.3 billion by 2050, of whom 60% will be urban. This urbanization is an important challenge for the next few decades. According to several research papers and reports, Africa's urbanization was, in contrast with most other regions in the world, not associated with economic growth in past decades. For instance, Ravallion, Chen and Sangraula (2007) find that urbanization helps poverty reduction in other regions, but not in Africa.

However, the picture appears to be different now and Africa has been growing at the same rate as the rest of the world, if not better in the recent few years. In 2012, six of the fastest economic growth countries in the world were in Africa (chapter 1). Rapid urbanization and investment in human capital seems to be modifying the pattern of economic growth in Africa in the recent period, even if there are no academic studies confirming that observation.[3] Governments have often tried to influence the pace or location of urbanization. Generally, efforts consisted in shifting resources from agriculture to finance the expansion of modern and more productive economic sectors—usually manufacturing and services—which were concentrated in cities.

Researchers, governments, international organizations and donors now seem to agree that it is urgent to develop consistent policy actions in urban planning and governance in Africa in the next decades, as African cities are expected to become home of more than half of Africa's population by 2030. Understanding the links between urbanization, human capital and economic growth can help build more efficient urbanization policies in Africa.

The objective of this chapter is to investigate the impacts of urbanization on human capital and economic growth in Africa. It seeks to contribute to the urbanization–growth debate by investigating how urbanization is linked to human capital accumulation and economic growth. More precisely, compared to previous studies on the urbanization-growth nexus, we (i) focus exclusively on African countries; (ii) consider both direct and indirect channels through which urbanization may influence economic activity and (iii) examine a long period including the evolutions observed in the recent years.

2. The urbanization-growth nexus in the literature

There are varieties of channels through which urbanization can affect economic growth and the majority of studies suggest that urbanization should have a positive impact on economic growth.[4]

First, cities play a vital role in the economic and social fabric of both developed and developing countries by offering opportunities for education, employment and health services. Education capital determines the ability of a nation to develop new technologies and adopt existing technologies.[5] Health capital can influence economic activity directly through its impact on labor productivity.

Expanding education systems in urban areas is easier and costs less than expanding it in rural areas. Returns to education are thus generally found to be higher in urban than rural areas. The effect of urbanization on education is generally positive, and empirical literature shows this correlation especially in Asia. Urban populations have more chance to reach hospitals, care centers and sanitation. Health care systems are also more developed, which may lead to better health performance than those in rural areas. Moreover, urban workers have better access to transport and to other facilities such as water, the Internet and electricity. Firms and workers may have higher productivity in urban than rural areas.

Second, urbanization implies agglomeration of people and firms, which reduces production costs. Urbanization permits external scale and scope economies, reduces transactions costs, and allows specialization among firms leading to low costs of production.[6] [7] Rosenthal and Strange (2004) report that doubling the size of cities can lead to an increase in productivity of some 3–8%. Actually, urban areas generate 85% of GDP in high-income countries.

Third, urbanization seems to be a key factor in entrepreneurship.[8]. Urban populations access finance and promote easily their ideas and have to some extent a local market (an urban market with higher consumer density) to do business. Loughran and Schultz (2005) show that geography affects firms' performance: ceteres paribus, urban firms are more profitable than rural firms. Poverty reduction can be associated with the ability to become entrepreneurs and to make one's own business. This shift in behavior makes urban areas more attractive for entrepreneurs and entrepreneurship.

Moreover, a city's prosperity and growth depend crucially on its ability to attract productive workers, match them appropriately to jobs, and further develop their skills.[9] The importance of skills has been stressed in urban economics since its beginning. Urbanization causes migration of talent and skilled people to major cities. This concentration causes interactions and engenders spillovers of knowledge and skills. Skilled people upgrade their skills and knowledge more efficiently when they are exposed to similar profiles and skilled people (urban areas) than in places where they do not interact with peers (rural areas). This raises productivity in urban areas.

Fourth, there are spillover effects or positive externalities of urban development on rural areas.[10] Through migration, remittances and interactive activities between urban and rural areas, urbanization can have positive effects on both finance and human capital. Through migration, transfer of information, production skills and technology can all be improved in migrant-sending areas.[11]

However, this positive effect of urbanization on economic growth is not always observed.[12] Both economic theory and empirical studies suggest that there is an inverted U-shape relationship between urbanization and economic development:[13] in the first stage of development, urbanization improves economic growth; in the second stage, there is a negative correlation between urbanization and economic growth. Rapid urbanization can negatively impact the economy via its effect on straining infrastructures.[14] Thus it seems that the effect of urbanization

on economic activity is complex and depends on several factors such as level of development, stage of urbanization, and nature of main economic activities.[15]

In what follows, we investigate the urbanization-growth relationship in Africa by focusing in particular on the impact of urbanization on human capital accumulation.

3. Methodology

To understand the relationship between urbanization and economic growth in Africa, we proceed in three steps. First, we propose a landscape of African urbanization in order to apprehend what makes urbanization in Africa different from other regions in the world. Second, we test for Granger causality relationships between urbanization and human capital and economic variables. Finally, we run some panel regressions to assess the intensity of links between the variables. More specifically, we run regressions of education and health variables, and per capita GDP on urbanization and other explanatory variables, using panel data from African countries. An outcome variable—GDP, education and health variables—is assumed to be a function of urbanization and other explanatory variables as follows:

$$y_{it} = \beta_0 + y_{i,t-1}\beta_1 + U_{it}\beta_2 + U_{it}^2\beta_3 + X_{it}\beta_4 + G_t\beta_5 + v_i + u_{it}, \quad (1)$$

where y_{it} is an outcome of interest (per capita GDP, economic structure, education and health variables) of country *i* in year *t, and* $y_{i,t-1}$ is the lagged dependent variable. U_{it} are the share of urban population in the total population of country *i* in year *t*, and U_{it}^2 is the squared share of urban population. X_{it} is a vector of explanatory variables including the population density, the share of population aged 0-14 (% of total), the share of population age 65 and above (% of total). G_t is a vector of year dummies. The error term is decomposed into time-invariant component v_i and time-variant component u_{it}. The effect of urbanization is measured by β_2 and β_3.

We tend to use a small set of control variables that are more exogenous. The control variables should not be affected by the variable of interest, i.e. the share of urban population in this study.[16] As urbanization can affect development and GDP, it can also affect a large number of economic outcomes in the countries. In addition, the difference data were used and time-invariant control variables removed from the estimation. Thus the number of control variables is small in the regressions.

As the estimation of urbanization can be biased due to the correlation between urbanization variables and errors, finding a convincing instrument for urbanization is challenging. In this study, we first use panel data to eliminate the time-invariant component v_i by the first-differencing of equation (1):

$$\Delta y_{it} = \Delta y_{i,t-1}\beta_1 + \Delta U_{it}\beta_2 + \Delta U_{it}^2\beta_3 + \Delta X_{it}\beta_4 + \Delta G_t\beta_5 + u_{it} \quad (2)$$

However, it is possible that $\Delta y_{i,t-1}$, ΔU_{it} and ΔU_{it}^2 can still be correlated with Δu_{it}. A widely-used Generalized Method of Moments (GMM) developed by Holtz-Eakin, Newey and Rosen (1988) and Arellano and Bond (1991) are used. The GMM-type instruments for the above differenced endogenous variables are higher-order lags of these variables.

All the data used to obtain the results we will report in the next section are sourced from the World Development Indicators database.[17] A description of summary statistics of variables used in this study is given in annex 6.1.

4. Results

4.1 The landscape of African urbanization

Trends and regional differences

Although the rhythm of urbanization in Africa is the highest in the world, the continent is still the least urbanized region in the world. By 2008, the whole of Africa had only 39.1% of its population living in urban areas. This proportion is far behind that of the Arab States, Latin America and the Caribbean, Eastern Asia, and OECD (respectively, 55%, 77%, 43% and 75%). Furthermore, urban population is growing by nearly 3.4% a year making Africa's urban population the fastest growing in the world. Predictions are for about 700% increase over 2000–2030. By 2030, it is projected that one-half of the African population will reside in urban areas (table 6.1). According to UN-HABITAT (2010), urban population in Africa is expected to increase from 395 million people in 2010 to one billion in 2040. For instance, the city of Lagos, home to 8 million in 2000 is anticipated to exceed 16 million by 2015.[18]

Table 6.1 Proportion of African population residing in urban areas by subregion, 1980-2030

Region/subregion	1980	1990	2000	2010	2020	2030
Africa	27.9	32.0	35.9	39.9	44.6	50.0
Eastern Africa	14.4	17.7	21.1	24.6	29.0	34.8
Northern Africa	44.4	48.5	51.1	53.5	56.8	61.3
Southern Africa	31.5	36.7	42.1	47.1	52.3	57.9
Western Africa	29.2	33.0	38.4	44.1	50.1	56.1

Source: UN-HABITAT 2008.

Africa's urbanization varies by sub-region. While Northern and Southern Africa exhibit rapid urbanization, Eastern and Western Africa are still mainly rural. Urbanization is unequal in the different regions of Africa because of the differences in geography, culture and economic activities. Understanding the impact of urbanization on economic growth in Africa needs to take into account these differences.

Causes of rapid urbanization in Africa

Urban economic theories usually identify two explanations of rural–urban migration. The first relates to Lewis (1977) focusing on the 'pull' side. The second view relates to factors affecting the rural sector that drives the 'push' of population shifts into cities. Migration to cities may result from displacement due to civil conflicts, drought or other shocks to agricultural productivity and can be seen as a survival strategy.

In Africa, people migrate to urban areas primarily in response to the better job and economic opportunities available ('pull') there but also because of climate variability and civil wars. ('push') Given the persistence of rural–urban wage gaps in both developed and developing countries, migration to urban areas is unavoidable and even desirable as a way to improve allocation of human resources, especially in land-scarce countries.[19] Africans also migrate to escape for example drought, famine, flooding, internal conflict such as civil war, and inequalities in the spatial distribution of social, cultural and political opportunities. Because Sub-Saharan economies are more dependent on rainfall and agriculture accounts for more than twice the share of GDP there than in other developing regions, climate also causes migration to urban areas. Sub-Saharan Africa suffers from a variety of chronic diseases that affect labor productivity and can be exacerbated by lack of rainfall.

Scholars claim that climate change is affecting agriculture productivity and accelerating rural–urban migration. Barrios, Bertinelli and Strobl (2006) use rainfall data to show that low rainfall (low agricultural productivity) is associated with higher contemporary urbanization in Africa. Brückner (2012) finds also that a decrease in the share of agricultural value added leads to a significant increase in urbanization for a panel of 41 African countries during 1960–2007. Poelhekke (2011) explains African urbanization mainly by rural–urban migration as an insurance mechanism for agricultural risk—due to higher aggregate agriculture risk, which induces rural–urban migration. Uninsurable expected risk will lead such migration, and climate change may accelerate it if solutions like micro-insurance and change in productive methods (such as irrigation) are not brought in.

Rapid urbanization may also partly due to improving health condition in cities**.** Urban areas and cities generally exhibit rapid growth owing to better health conditions. But many rural dwellers choose to become urban inhabitants and end up in slums, which do not necessarily offer better living conditions than rural areas for a given income. Cities offer transport, infrastructure and access to knowledge and technology, all of which are highly beneficial to labor productivity. Africa is expecting to double its population by 2050, pointing to extensive pressure on urban spaces and urbanization. At the same time, urban populations are more aware of contraception and more likely to have fewer children. Rapid urbanization in Africa cannot be explained, only, by cities: Africa is also the world's youngest region, and in mid-2011 the top 10 countries with the youngest population were in Africa. By 2040 Africa will have the largest workforce, surpassing those in China and India.

Urbanization and Poverty

Unlike similar trends in Asia and South America, urbanization in Africa is characterized by high poverty. Sub-Saharan African countries have the highest levels of urban poverty in the world. Despite African cities generating about 55–60% of the continent's GDP, 43% of its urban populations live below the poverty line. Urban poverty in Africa frequently manifests itself in unequal access to decent housing. For example, the majority of the urban and peri-urban poor tend to live in ecologically fragile zones where they overexploit the surrounding lands.

Urbanization in Africa is characterized by a high proportion of urban poor living in slums: Sub-Saharan Africa's slum population was recently more than 60% among urban residents. They tend to lack basic urban services such as access to sanitation, clean water, energy and solid waste disposal. This population is likely to be adversely affected by climate change and its

effects, since their precarious living conditions make them particularly vulnerable to disease and natural disasters.

Urbanization and education

Urbanization improves access to basic education for all. Expanding education systems in urban areas is easier and costs less than in rural areas. Thus Africa's rapid urbanization is expected to increase enrollment, especially at primary level. Indeed, the nature of cities appears to provide incentives for investment in education by residents. Returns to education are generally higher in urban than rural areas—and so literacy rates and enrollment should be higher in urban than rural areas.

There is a positive relationship between urbanization and education (table 6.2): school enrollment at both primary and secondary level increases with urbanization. While enrollment in primary schools is less than 50% in regions with an urban population share less than 20%, it is more than 88% for regions with an urban population share between 50% and 90%. Enrollment in secondary school shows more profound effects. The average enrollment rate in areas with urbanization less than 20% is 12.2%. This rate is 55.2% for areas with an urbanization rate between 50% and 90%. Moreover, urbanization is closing the gender gap. The primary enrollment gap in areas where urbanization is between 30% and 40% is 11.9% higher for male than female students, while this gap is only 4.1% in favor of male students in areas where urbanization is between 50% and 90%. In secondary schools, the dividend is more pronounced. The secondary enrollment rate gap in areas where urbanization is between 30% and 40% is 5.2% higher for male than female students, while this rate moves in favor of females with a gap of 2.2% in favor of female students in areas where urbanization is between 50% and 90%. Urbanization seems to imply a double dividend: fostering global enrollment rate in primary and secondary schools, and closing the gender gap.

Table 6.2 School enrollment by urban population share

Urban population share (%)	School enrollment, primary (% net)	School enrollment, primary, female (% net)	School enrollment, primary, male (% net)	School enrollment, secondary (% net)	School enrollment, secondary, female (% net)	School enrollment, secondary, male (% net)
0-20	49.6	47.3	49.7	12.2	12.1	12.8
20-30	60.0	54.8	63.5	18.6	17.4	19.2
30-40	67.1	60.6	72.5	23.8	21.2	26.3
40-50	75.6	69.3	77.3	39.4	37.9	41.5
50-90	88.3	84.6	88.7	55.2	54.0	51.8
Total	**66.5**	**61.5**	**68.4**	**25.1**	**23.9**	**25.5**

Source: Authors' estimation using World Development Indicators Database

Tertiary education is very weak in Africa with only 3.9% of the population enrolled. Urban enrollment in tertiary education in areas with an urban share between 50% and 90% is 10 times as high as in areas with urbanization below 20% (table 6.3). As at primary and secondary level, urbanization seems to help close the gender gap at tertiary level, notably because most tertiary level institutions tend to cluster in urban areas.

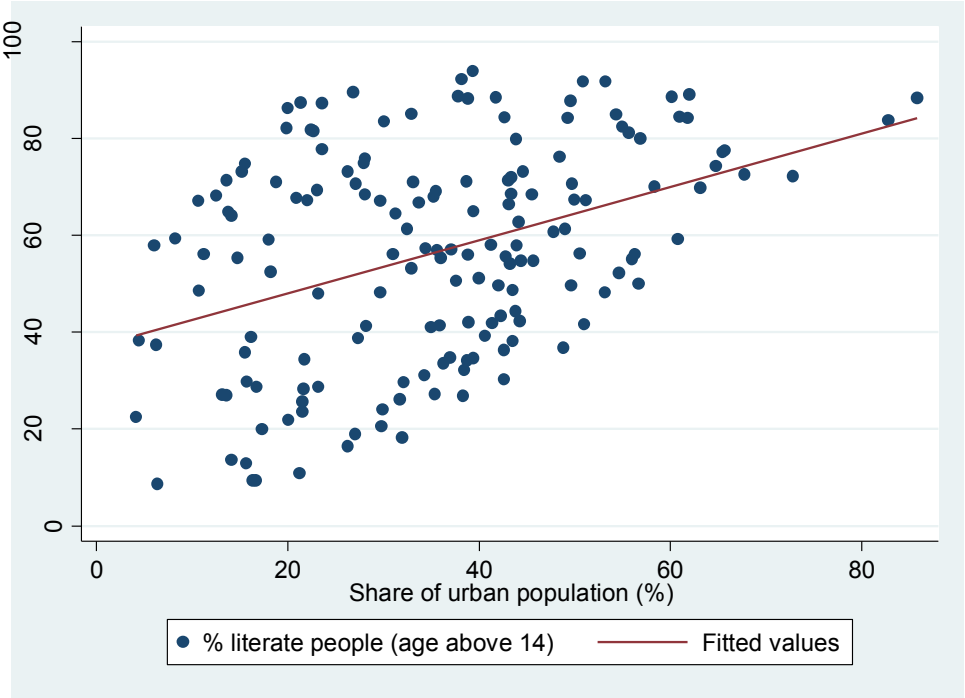
Table 6.3 School enrollment by urban population share

Urban population share (%)	School enrollment, tertiary (% net)	School enrollment, tertiary, female (% net)	School enrollment, tertiary, male (% net)
0-20	1.1	0.6	1.4
20-30	2.0	1.4	2.7
30-40	2.9	1.7	4.4
40-50	8.7	7.4	11.3
50-90	11.1	10.9	11.8
Total	**3.9**	**3.3**	**5.0**

Source: Authors' estimation using World Development Indicators Database.

There a strong cross-sectional positive correlation between the literacy rate and urban population share in Africa (figure 6.1). Africa seems to benefit from this urbanization dividend.

Figure 6.1 Literacy and urban population share



Source: Authors' estimation using World Development Indicators Database.

Urbanization and Health

Urban populations have more chance to reach hospitals and care centers, and to have access to sanitation. Health care systems are also more developed, which may lead to better health performances than those in rural areas. Fink and Hill (2013) demonstrate that urbanization significantly reduces under-five mortality in developing countries, from 92 to 56 deaths per 1,000 live births on average between 2001 & 2010. However, urbanization is also associated with substantial pollution (air and water) and pervasive traffic congestion. In particular, rapid and generally unplanned urbanization in Africa is associated with environmental deterioration, settlement on marginal lands and degradation of basic services such as drinking water, sanitation

and waste disposal and treatment. Mitigating the potentially harmful impact on public health will depend strongly on public policies pursued by governments.

From our own data, life expectancy is 16.2 years more in areas where urbanization is between 50% and 90% than in areas where it is below 20% (table 6.4). Life expectancy at birth is higher for females than males in all areas and the difference is stable, and does not seem linked to urbanization. On average females have three years of life expectancy more than males.

The infant mortality rate changes with the urban population share. It is 118.4 per 1,000 live births for areas under 20% but only 47.8 per 1,000 live births in areas with an urban population share from 50% to 90%. Under-five mortality shows a more pronounced effect: it is 204.3 per 1,000 live births where the urban population share is less than 20% and only 69.5 per 1,000 live births where that share is between 50% and 90%. Access to hospitals and to care centers, better health information and public health in rural areas may explain these figures and the significant differences.

Table 6.4 Life expectancy and child mortality by urban population share

Urban population share (%)	Life expectancy at birth, total (years)	Life expectancy at birth, female (years)	Life expectancy at birth, male (years)	Mortality rate, infant (per 1,000 live births)	Mortality rate, under-5 (per 1,000 live births)
0-20	45.8	47.1	44.5	118.4	204.3
20-30	48.7	50.0	47.4	106.0	174.9
30-40	50.7	52.1	49.4	97.9	158.4
40-50	57.9	59.9	56.1	72.3	108.3
50-90	62.0	63.8	60.2	47.8	69.5
Total	50.5	52.0	49.1	97.2	159.9

Source: Authors' estimation using World Development Indicators Database

Childhood malnutrition is still high in Africa: 38.7% of children under five have malnutrition, which seems linked to urbanization. While the prevalence of malnutrition (height for age) in areas with an urban population share below 20% is 48.9%, this figure is only 25.3% in areas with an urban population share between 50% and 90%. The same trend is found with weight for age: while the rate is about 26.2% in areas with an urban population share below 20%, the figure is only 9.5% in areas where that share is between 50% and 90%.

Differences between urban and rural areas in health care centers and access to health facilities explain the differences in life expectancy and childhood malnutrition (table 6.5). On average, only 46.2% of African children are taken to a health provider: only 41.7% in areas with an urban share less than 20% and 51.2% in areas with an urban share between 50% and 90%. Moreover, births attended by skilled staff are only 38.3% in areas with an urban population share below 20% and 78.0% in areas with that share between 50% and 90%. Urban parents are twice as likely as rural parents to have a child attended by skilled staff. The number of community health workers per 1,000 inhabitants is higher in areas with a less than 20% urban population share than in areas with that share between 50% and 90%.

Table 6.5 Health care utilization by urban population share

Urban population share (%)	% of children under 5 taken to a health provider	Births attended by skilled health staff (% of total)	Community health workers (per 1,000 people)	Health expenditure, public (% of government expenditure)	Health expenditure, total (% of GDP)
0-20	41.7	38.3	0.51	9.8	5.8
20-30	48.6	49.2	0.58	10.4	5.3

30-40	45.5	50.1	0.24	9.6	5.9
40-50	46.3	59.4	0.23	8.2	5.3
50-90	51.2	78.0	0.35	8.2	5.0
Total	46.2	54.1	0.36	9.2	5.5

Source: Authors' estimation using World Development Indicators Database

Careful examination of those living in slums is needed. Antai and Moradi (2010) show that under-five childhood mortality increased in those areas in Nigeria during 1983–2003. So, while global trends show a generally positive impact of urbanization on health, more studies on these disadvantaged areas are needed.

Urbanization and economic transformation

Employment in agriculture is still high in Africa (table 6.6). On average, 37.1% of the total is in that sector. However, the picture is highly contrasted between less (76.1%) and more urbanized areas (21.3%). Agricultural value added shows the same pattern: in developed countries it is around 2% of GDP, but in Africa is still very high at 30.5%. Urbanization is affecting this pattern, though. For less urbanized areas, agriculture value added is 41.8% but only 10.0% in more urbanized areas.

Urbanization is causing economic transformation of Africa, confirmed when we observe industry and services. Industry grows in more urbanized areas. Employment in industry varies from 6.1% in less urbanized areas to 26.1% in the most urbanized areas. Industrial value added is also linked to urbanization. While it accounts for 18.3% in the less urbanized areas, it accounts for 39.0% in the most urbanized areas. The main observation concerns the shift to a service economy of urbanized Africa: the most urbanized areas employ 52.6% of workers in services, the less urbanized areas 17.8%. Services value added in the most urbanized areas is 51.0% of GDP.

Table 6.6 Economic structure by urban population share

Urban population share (%)	Employment in agriculture (% of total employment)	Employment in industry (% of total employment)	Employment in services (% of total employment)	Agriculture, value added (% of GDP)	Industry, value added (% of GDP)	Services, etc., value added (% of GDP)
0-20	76.1	6.1	17.8	41.8	18.3	40.0
20-30	74.6	5.6	19.8	32.0	23.9	44.1
30-40	52.0	11.2	36.8	31.5	26.4	42.1
40-50	27.6	25.1	47.3	20.5	30.4	49.1
50-90	21.3	26.1	52.6	10.0	39.0	51.0
Total	37.1	20.2	42.8	30.5	25.5	44.0

Source: Authors' estimation using World Development Indicators Database

These findings confirm the hypothesis according to which urbanization is shifting Africa's economy from agriculture to services. This shift is due to the availability of workers and skills in urban areas. But despite this shift, unemployment and poverty are high, especially in urban areas.

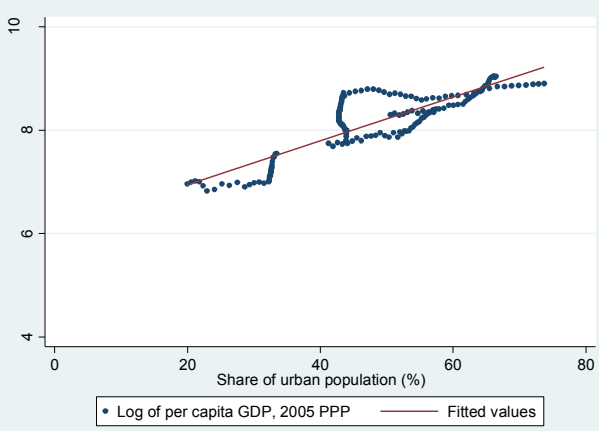
Urbanization and economic growth

The relationship between GDP per capita and urban population share seems to be positive (figure 6.2). While countries below 20% of urban population share have the weakest GDP per capita, countries over 60% have the strongest. Intermediate countries vary widely. The relationship is clearer when we observe North African countries. GDP per capita is strictly increasing with urban population share. The explanation of this relationship, as our conceptual framework advocates, is that urbanization permits human capital accumulation, which implies growth as

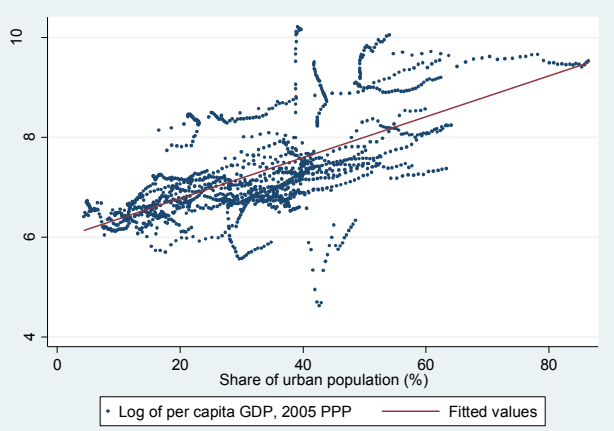
endogenous growth theories suggest. The economic transformation allows the hiring of people in more efficient sectors offering better wages.

Figure 6.2 GDP per capita and urbanization in Africa

North Africa



Sub-Saharan Africa



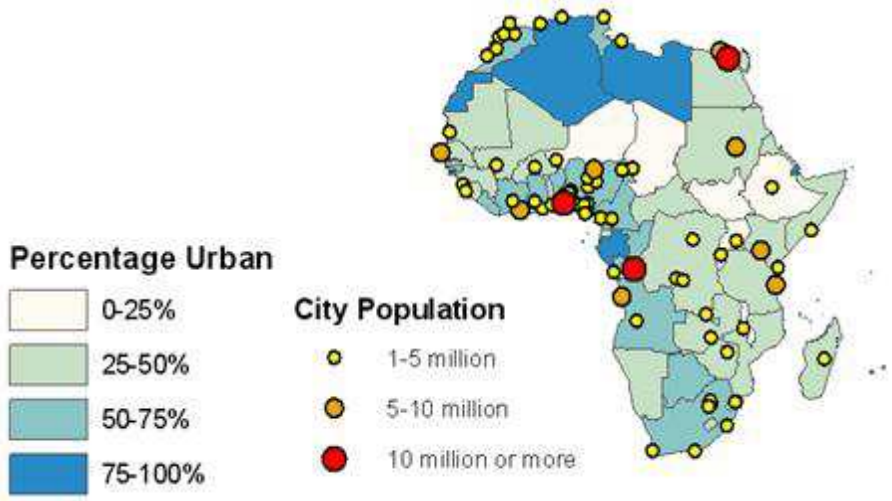
Source: Authors' estimation using World Development Indicators Database

However, when one looks at Sub-Saharan Africa the positive relationship between urbanization and economic growth appears to be less clear. In the next sub-sections, we will use robust statistical techniques to test for the significance of this relationship and the intensity of the potential impact of urbanization on economic growth in SSA. Indeed, there was a mystery over the lack of a positive relationship between growth and urbanization in Sub-Saharan Africa over the past decades. A possible explanation may be the importance of 'push' conditions relative to 'pull' ones. While in other parts of the world, migration from rural areas to urban areas is explained by the positive externalities of urbanization and shifts in the economy from agriculture to manufacturing and services, Barrios, Bertinelli and Strobl (2006) indicate that "unlike the rest of the world, African urbanization has been driven by geographical 'first nature' conditions, climate change, in particular, that have made the countryside unviable. Urbanization is "flight", reflecting choices made under duress, rather than migration to unduly attractive cities." Anne, Buckley and Kalarickal (2010) extend this analysis and find similar results, demonstrating "the strong links that exist between geographical factors and urbanization trends in Africa, while finding that the linkage between policy and urbanization trends is weak."

Moreover we should notice that in contrast to Asian and Latin American developing countries, Africa has not enough mega-cities (figure 6.2) relative to its aggregate population, with only three surpassing 10 million inhabitants.[20] This leads to lack of agglomeration effects and areas of innovation. Cities are not serving as engines of growth and structural transformation. Instead, they form part of a major symptom of economic and social crisis that have enveloped the continent.[21] Weak economic performance in Africa was associated with its economic geography given its small market size, undersupply of public goods and weak business environment. Venables (2010) also associates the lack of big cities as one explanatory factor. He advocates developing clusters of export-oriented manufacturing in coastal economies: "Africa's fragmentation and consequent urban structure may have impeded the development of major international manufacturing centers of the type that contribute to the performance of high growth economies."[22] However, the picture

seems to be changing: several cities in Africa are exhibiting huge transformations, including urbanization rates, which are among the highest in the world.

Figure 6.1 Urbanization in Africa



Source: UN-HABITAT 2012.

Finally, it seems that urbanization is rapid but is not backed by urban-based investment or much formal-enterprise growth. This too is something of a puzzle.[23] Most urban business in Africa is in the informal sector. Elgin and Oyvat (2013) show an inverted U-shape relationship between informality and urbanization. In the early stage of urbanization the informal sector grows, but tends to fall in the later stages. African urbanization can be considered as an earlier stage, leading to expansion of the informal sector. However, on average African countries are not seeing the expected level of economic growth in proportion to the high proportion of informality and rate of urbanization, which requires a specific explanation.

4.2 Granger causality tests

Before estimating the intensity of the impact of urbanization on human capital and economic activity in Africa using regressions, we proceed to Granger causality tests on data aggregated for all Africa, North Africa and Sub-Saharan Africa. We consider the following variables: child mortality, employment, GDP per capita, health expenditure, human development (which combines indicators of life expectancy, educational attainment and income into a composite index, the HDI), life expectancy, school enrollment (primary) and the share of urban population.[24]

Results are summarized in table 6.7. We test for the following null hypothesis: the share of urban population does not Granger causes the other variables of interest. Thus, we report the p-value for the causality running from the share of urban population to the other studied variables. Recall that the p-value provides the smallest level of significance at which the null hypothesis would be rejected, the smaller the p-value, the stronger the evidence is in favor of the alternative hypothesis of causality.

Table 6.7 Causality tests: The share of urban population does not Granger-cause

Variable	All Africa P-value	North Africa: P-value	Sub-Saharan Africa: P-value
Child mortality	0.5202	**0.0389**	**0.0806**
Employment	**0.0592**	**0.0389**	**0.0806**
GDP per capita	0.6845	0.5798	**0.0082**
Government health expenditure	**0.0474**	0.1149	**0.0271**
Health expenditure	**0.0608**	—	0.1268
Human capital development	**0.0008**	—	**0.0041**
Life expectancy	0.9580	**0.0056**	0.7422
School enrollment-primary	**0.0052**	**0.0332**	**0.0021**

Note: — denotes that the considered variable is not cointegrated with the share of urban population. Figures in bold indicate significance at 10% significance.
Source: Authors' estimation using World Development Indicators Database

When data aggregated over all Africa are considered, the share of urban population Granger-causes employment, government and global health expenditure, and human capital development. Thus our findings suggest that urbanization by offering more job opportunities increases the rate of employment and public and private investments in health, increasing human capital.

In North Africa, the share of urban population Granger-causes employment and life expectancy. However, urbanization does not seem to be linked to private and public expenditure, or to the global index of human development in North Africa.

In Sub-Saharan Africa, the findings in the last column show that the share of urban population Granger-causes GDP per capita and human capital development. If we look at details: urbanization affects employment and health expenditure. However, the global effect on life expectancy is not significant. The next sub-section examines further these relationship based of panel regression results.

4.3 Regression results

The GMM-instrumental regressions are presented in tables 6.8–6.10.[25] Table 6.8 shows that the effect of urbanization on education enrollment is positive and statistically significant. The positive effect holds for all the education level and for both boys and girls. A 1 percentage point increase in the share of urban population is associated with a 0.25 percentage point increase in primary school enrollment. The effect of the urban population on secondary and tertiary school enrollment is 0.96 and 0.07 percentage points, respectively.

In table 6.9, we examine the effect of the urban population share on health variables. We find a positive effect of the urban population share on the life expectancy, and this effect is diminishing across the level of the urban population share. It means an inverted U-shape relationship between the urban population share and life expectancy. The effect of urbanization on mortality rate also follows a U-shape curve. It means that in the early stages the mortality rate decreases as urbanization increases, but in the later stages it increases as urbanization continues. Possibly, the constraints on health care facilities in urban areas cannot provide good health care services for urban populations as it grows quickly. Other issues may be pollution and environments in urban areas that can cause health problems for urban dwellers.

The effects of urbanization on GDP and economic structure of the economy is presented in table 6.10. It shows an inverted U-shape relationship between the urban population share and per capita GDP. The peak of urbanization is around 73%—equal to 0.00391/(2*0.0000269). After

this point, higher urbanization is associated with decreasing per capita GDP if other factors are kept constant. When we exclude North African countries and run the regression using the sample of Sub-Saharan countries, we find very similar results of an inverted U-shape with a peak around 70%. The share of employment in industry and the share of services in GDP also follow an inverted U-shape relationship with urbanization.

Using more robust econometric techniques, Arouri, Ben-Youssef, Nguyen-Viet and Soucat (2014 a,b) Confirm that the relationship between urbanization and economic growth in Africa is nonlinear and that human capital accumulation shapes this relationship: a good level of human development benefits the growth effect of urbanization, while a weak human capital development amplifies negative effects of urbanization.

Table 6.8 GMM regressions of education variables on the share of urban population

Explanatory variables	School enrollment, primary (% net)	School enrollment, primary, female (% net)	School enrollment, primary, male (% net)	School enrollment, secondary (% net)	School enrollment, secondary, female (% net)	School enrollment, secondary, male (% net)	School enrollment, tertiary (% gross)	School enrollment, tertiary, female (% gross)	School enrollment, tertiary, male (% gross)
Share of urban population (%)	0.25307***	0.14358**	0.62771***	0.86897***	-0.52769**	0.95221***	0.06972***	0.06266***	0.09481***
	(0.06060)	(0.06902)	(0.18547)	(0.20785)	(0.24609)	(0.33238)	(0.01076)	(0.02082)	(0.02236)
Squared share of urban population (%)			-0.00502**		0.01354***				
			(0.00220)		(0.00303)				
Lagged dependent variable	0.88529***	0.90227***	0.84468***	-0.04292	0.55927***	-0.16145***	0.90005***	0.85870***	0.82878***
	(0.01931)	(0.02085)	(0.02412)	(0.05840)	(0.05610)	(0.05564)	(0.01280)	(0.02220)	(0.02185)
Population ages 0-14 (% of total)	0.33299***	0.25728**	0.33383**	0.43497	0.23703	0.54265	-0.07520***	-0.10002***	-0.07301*
	(0.10994)	(0.11735)	(0.13685)	(0.32785)	(0.19725)	(0.56201)	(0.02355)	(0.03805)	(0.04052)
Population ages 65 and above (% of total)	0.24793	-0.10451	0.77619	1.04978	-5.81053***	6.38029**	0.36197***	0.43991**	0.36645*
	(0.64061)	(0.69606)	(0.78704)	(1.66933)	(1.32447)	(2.87593)	(0.11616)	(0.20477)	(0.21036)
Population density (people per sq. km of land area)	0.11071***	0.09718***	0.09830***	0.00199	0.08694**	-0.03959	-0.00151	-0.00846*	-0.00133
	(0.01911)	(0.02111)	(0.02416)	(0.06115)	(0.03504)	(0.09935)	(0.00222)	(0.00490)	(0.00518)
Constant	-21.7058***	-16.3724**	-24.1638***	-21.6134	15.34794	-35.38091	0.96120	2.28318	0.01559
	(7.31914	(7.8247)	(8.5270)	(15.8510)	(10.24626)	(26.77516)	(1.50525)	(2.52726)	(2.70147)
Observations	730	649	649	257	249	249	957	699	699
Number of counties	48	47	47	38	38	38	49	48	48

Standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%.
Source: Authors' estimation using World Development Indicators Database

Table 6.9 GMM regressions of health variables on the share of urban population

Explanatory variables	Life expectancy at birth, female (years)	Life expectancy at birth, male (years)	Life expectancy at birth, total (years)	Mortality rate, infant (per 1,000 live births)	Mortality rate, under-5 (per 1,000 live births)	Health expenditure, public (% of government expenditure)	Health expenditure, total (% of GDP)
Share of urban population (%)	0.01252***	0.01376***	0.01313***	-0.09772***	-0.19343***	0.13483***	0.08748***
	(0.00111)	(0.00147)	(0.00107)	(0.00369)	(0.01866)	(0.05232)	(0.02455)
Squared share of urban population (%)	-0.00029***	-0.00029***	-0.00029***	0.00123***	0.00238***	-0.00166***	-0.00102***
	(0.00001)	(0.00002)	(0.00001)	(0.00005)	(0.00024)	(0.00059)	(0.00028)
Lagged dependent variable	1.00042***	0.99658***	0.99888***	0.99007***	0.98474***	0.64543***	0.82175***
	(0.00066)	(0.00096)	(0.00067)	(0.00068)	(0.00179)	(0.02803)	(0.02264)
Population ages 0-14 (% of total)	0.02475***	0.01559***	0.01991***	-0.08436***	-0.22150***	0.01125	-0.02446
	(0.00118)	(0.00157)	(0.00113)	(0.00488)	(0.02448)	(0.03745)	(0.01719)
Population ages 65 and above (% of total)	0.05012***	0.03142***	0.03944***	-0.12249***	-0.41749***	-0.17175	-0.24224**
	(0.00684)	(0.00903)	(0.00657)	(0.02832)	(0.14290)	(0.21351)	(0.10049)
Population density (people per sq. km of land area)	0.00060***	0.00058***	0.00059***	-0.00298***	-0.00635***	0.00435***	0.00154***
	(0.00011)	(0.00014)	(0.00010)	(0.00018)	(0.00091)	(0.00106)	(0.00049)
Constant	-0.82120***	-0.26074***	-0.54346***	4.63609***	12.46084***	0.76159	1.16725
	(0.06865)	(0.08970)	(0.06552)	(0.29581)	(1.51512)	(2.67605)	(1.22898)
Observations	2559	2559	2559	2400	2400	794	796
Number of counties	51	51	51	51	51	51	51

Standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%.
Source: Authors' estimation using World Development Indicators Database

Table 6.10 GMM regressions of GDP and economic structure

Explanatory variables	Log of per capita GDP, 2005 PPP	Employment in agriculture (% of total employment)	Employment in industry (% of total employment)	Employment in services (% of total employment)	Agriculture, value added (% of GDP)	Industry, value added (% of GDP)	Services, etc., value added (% of GDP)
Share of urban population (%)	0.00391***	-5.5947	10.1816***	-1.8874	-0.03250	-0.01413	0.10471**
	(0.00112)	(8.5863)	(3.1489)	(6.3539)	(0.04421)	(0.03883)	(0.04539)
Squared share of urban population (%)	-0.00003**	0.04451	-0.08415***	0.01085	0.00035	0.00008	-0.00099**
	(0.00001)	(0.07852)	(0.02871)	(0.05850)	(0.00046)	(0.00041)	(0.00047)
Lagged dependent variable	0.95818***	0.63939***	0.68499***	0.59394***	0.89489***	0.91974***	0.81397***
	(0.00619)	(0.10867)	(0.09945)	(0.11332)	(0.00997)	(0.00915)	(0.01321)
Population ages 0-14 (% of total)	0.00316***	-1.84640*	0.68634*	0.80764	-0.02747	0.06186	-0.03301
	(0.00103)	(1.07792)	(0.37394)	(0.76018)	(0.04396)	(0.03858)	(0.04467)
Population ages 65 and above (% of total)	0.01623***	2.10820	-1.55911	-1.01752	-0.07249	-0.17843	0.61022**
	(0.00570)	(4.31332)	(1.49726)	(3.30918)	(0.25294)	(0.22150)	(0.26038)
Population density (people per sq. km of land area)	-0.00002	-0.29000	0.13543**	0.17889	-0.00845*	-0.00401	0.01993***
	(0.00009)	(0.18189)	(0.06406)	(0.13478)	(0.00433)	(0.00373)	(0.00445)
Constant	0.03680	266.440	-316.297***	36.19302	4.61237*	1.44926	4.01029
	(0.08122)	(250.91400)	(91.68356)	(186.35581)	(2.69625)	(2.31628)	(2.69010)
Observations	1459	88	88	88	2017	1991	1995
Number of counties	49	11	11	11	51	51	51

Standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%.
Source: Authors' estimation using World Development Indicators Database

5. Conclusion and policy implications

The dynamic panel data regressions we used to estimate the effect of urbanization on human capital and per capita GDP of African countries show an inverted U-shape relationship between the urban population share and per capita GDP. Urbanization also shows impacts on human capital variables, such as enrollment rates and health variables. Africa's human capital is fostered by these impacts, which are permitting greater and faster growth. Urbanization is reshaping the sectoral composition of the economy: services account for 51% of GDP in the most urbanized economies, and agriculture 76.1% of total employment in the less urbanized countries.

Our empirical findings suggest several policy implications. Sub-Saharan Africa now has inadequate planning systems, planning laws and building standards, bureaucratized and inefficient land policy and a shortage of qualified and active planners. Urban policies need to be revised in depth to foster human capital. At least five topics should be considered: training and education for urban decision makers; location management and subsidies, development of secondary towns, data for urbanization management, and management of the informal economy.

Rural–urban migration is still an open debate. According to the World Bank (2009) and Annez, Buckley and Kalarickal (2010), subsidies to assist the poor should be location neutral. Individuals rather than policymakers are in the best position to determine where they should live. But saying this implies that "laissez-faire" may lead to an anarchic growth of cities and towns in Africa with huge implications for providing clean water, electricity and waste management. The provision of urban infrastructure is key for boosting the urbanization dividend.

At the same time, for long-term rural–urban migration to reemerge as a major economic and demographic force, African urban economies must deliver greater economic security to the majority of urban residents.[26] Security in urban Africa needs to be put on the political agenda. Moreover, as it is well known, big cities need complex skills for their management and to be governed by participatory mechanisms. There is an urgency to address the challenge of skills for urban planners and more generally curricula in urbanization schools. While most academic papers, donor interventions and development agencies focus on big cities, new academic findings stress the possible role of secondary towns for inclusive growth.[27] These new approaches need to be confirmed by further research, but they also imply change in policymakers' decisions on secondary towns.

Finally, one should notice that urban policy in many African countries is simply absent or even sometimes "anti-urban".[28] Consequently, the precarious living conditions that define slums and informal work continue in a policy vacuum. Further, the data and analysis necessary to inform policy at country and city scales are inadequate or just do not exist.[29] Urbanization management needs to produce open data helping researchers and policymakers to do the right analysis and take the right decisions. Unfortunately, urban statistics for Africa may be "highly suspect," and many can be shown to be "downright wrong."[30]

Annex 6.1 Summary statistics of variables

Variable	Obs	Mean	Std. Dev.	Min	Max
Dependent variables					
Log of per capita GDP, 2005 PPP	1557	7.40	0.97	4.62	10.22
School enrollment, primary (% net)	930	66.54	22.25	9.70	100.00
School enrollment, primary, female (% net)	834	61.46	23.65	7.16	99.38
School enrollment, primary, male (% net)	834	68.41	20.14	12.18	99.96
School enrollment, secondary (% net)	371	25.09	21.04	0.09	97.57
School enrollment, secondary, female (% net)	357	23.88	21.54	0.05	99.71
School enrollment, secondary, male (% net)	357	25.54	19.94	0.14	98.13
School enrollment, tertiary (% gross)	1181	3.92	5.75	0.00	37.08
School enrollment, tertiary, female (% gross)	934	3.32	6.43	0.00	44.88
School enrollment, tertiary, male (% gross)	934	5.03	6.24	0.00	35.03
Wage and salaried workers, total (% of total employed)	135	42.06	26.50	1.40	84.80
Health expenditure per capita, PPP (constant 2005 international $)	847	150.29	204.57	0.00	1806.48
Health expenditure, public (% of government expenditure)	849	9.19	3.80	0.00	26.90
Health expenditure, total (% of GDP)	851	5.48	2.54	0.00	22.19
Life expectancy at birth, female (years)	2666	51.99	9.02	28.37	78.90
Life expectancy at birth, male (years)	2666	49.10	8.38	25.24	72.90
Life expectancy at birth, total (years)	2666	50.51	8.67	26.76	74.75
Mortality rate, infant (per 1,000 live births)	2536	97.15	41.74	11.20	237.40
Mortality rate, under-5 (per 1,000 live births)	2536	159.91	78.82	13.10	486.00
Employment in agriculture (% of total employment)	171	37.09	24.83	3.20	92.20
Employment in industry (% of total employment)	171	20.16	10.88	2.10	43.10
Employment in services (% of total employment)	171	41.54	16.13	5.60	68.60
Agriculture, value added (% of GDP)	2079	30.54	17.08	1.82	94.85
Industry, value added (% of GDP)	2055	25.47	13.86	1.88	94.42
Services, etc., value added (% of GDP)	2058	44.17	12.33	2.96	84.17
Explanatory variables					
Share of urban population (%)	2756	28.79	15.68	2.04	86.46
Population ages 0-14 (% of total)	2756	43.48	4.43	20.17	50.33
Population ages 65 and above (% of total)	2756	3.34	1.03	1.15	8.38
Population density (people per sq. km of land area)	2601	56.94	87.71	0.75	633.52

Source: Authors' estimation using World Development Indicators Database

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Notes

[1] Potts 2012.
[2] Bairoch 1988.
[3] Mijiyawa 2013.
[4] See, for example, Fay and Opal (2000) and Bertinelli and Black (2004).
[5] Aghion and Howitt 2009.
[6] Kumar and Kober 2012.
[7] Krugman 1991; Fujita, Krugman and Mori 1999.
[8] Glaeser, Rosenthal and Strange 2010.
[9] Bacolod, Blum and Strange 2010.
[10] Bairoch 1988; Williamson 1990; Allen 2009; Cali and Menon 2009.
[11] McKenzie and Sasin 2007.
[12] Fay and Opal 2000.
[13] Henderson 2003.
[14] Alam and others 2007.
[15] Castells 2011.
[16] Heckman, Lalonde and Smith 1999; Angrist and Pischke 2008.
[17] World Bank 2013. There are yearly data on 1,301 indicators of countries throughout the world since 1960. It has annual data on 1,301 indicators of countries throughout the world since 1960. It contains data on the share of countries' urban populations since 1960. However, many indicators such as those for health, education and employment are available only for recent years. See http://data.worldbank.org/.
[18] Anderson and others 2013.
[19] World Bank 2009.
[20] World Bank 2009.
[21] World Bank 2000.
[22] Venables 2010.
[23] Bryceson 2006.
[24] We proceed in three steps. First, to determine the order of integration of our series we apply three standard unit root tests: Augmented Dickey-Fuller (ADF), Phillips-Perron (PP) and Kwiatkowski and others (KPSS) tests. The ADF and PP tests are based on the null hypothesis of a unit root, while the KPSS test considers the null of no unit root. Results suggest that the series appear to be integrated of order one, which is a standard result in the literature for such series. Second, we apply three tests of the null hypothesis of no cointegration between the share of urban population and the considered series: ADF, PP and Johansen tests. In most cases, the considered variables appear to be cointegrated with the share of urban population, which suggests that urbanization moves together over the long-run with human capital and economic activity in Africa. Third, we implement Granger causality tests.

[25] We first include the squared share of urban population in all the regressions. However, in several regressions, the squared share of urban population is not statistically significant. For these regressions, we drop this squared share of urban population and use the linear function. It should be noted that we also run regression for the sample of Sub-Saharan countries and the results are very similar to those based on the full sample of all the Sub-Saharan countries. Possibly, the number of North African countries is very small compared with the number of Sub-Saharan countries. In this chapter, we report the regression results using the sample of all the African countries.

[26] Potts 2012.
[27] Dorosh and Thurlow 2013; Christiaensen, de Weerdt and Todo 2013.
[28] Pieterse 2010.
[29] Pieterse 2010.
[30] Potts 2012.